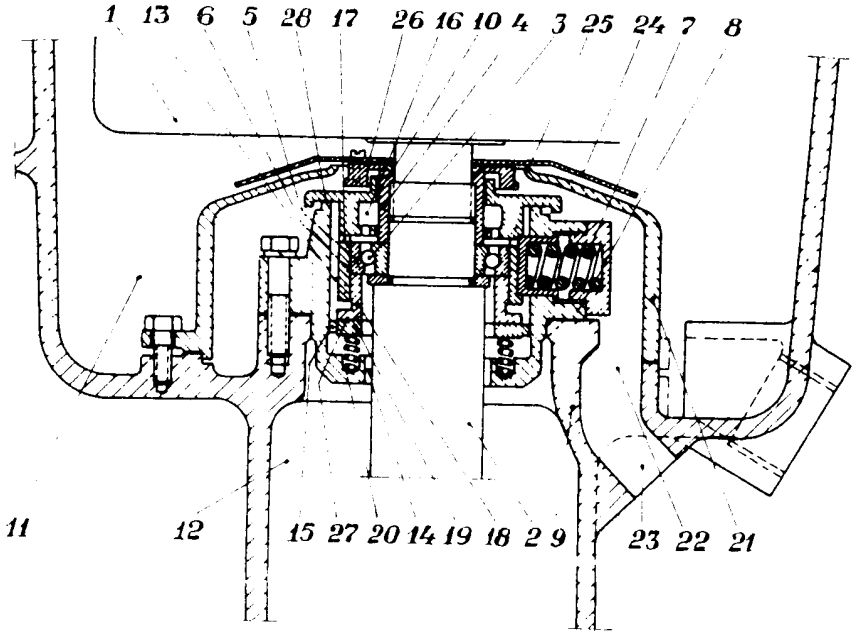

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PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in Flexible Bearings for Centrifugal Separators

We, AKTIEBOLAGET SEPARATOR, a Swedish Company, of 8 Fleminggatan, Stockholm 1, Sweden, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to flexible bearings for centrifugal separators.

The bowl spindle of a centrifugal separator is often mounted in an upper radially flexible bearing located immediately below the bowl, and a non-flexible bearing located at the lower end of the bowl spindle. In such arrangements the vertical forces are taken up either by the upper or by the lower bearing. In the bearing arrangement according to the present invention both the axial and radial forces are taken up by the same bearing and for this purpose a groove type ball bearing or an angular contact bearing may be used to advantage.

The requirements for a perfect bearing device are as follows:— If the pressures existing in the chambers above and below the bearing device differ (the lower chamber usually contains the driving device of the separator), strong air currents should not be permitted to pass through the bearing device, and if there is an upward flowing air current this must in no circumstances be permitted to cause the lubricating oil to leak out of the bearing. Due to the movements of the spindle, parts of the bearing device slide against each other, and the sliding surfaces must therefore be sufficiently lubricated to prevent undue wear.

The ball bearing proper should be so located that some oil from the chamber below the device can find its way up to the bearing. Even if the spindle oscillates considerably there must be no wide gaps or apertures between the parts, as this might bring the chambers above and below the bearing device in communication with each other and give rise to strong air currents through the said bearing device. The sliding movements of the parts caused by the movement of the spindle should take place along relatively large surfaces which will reduce the specific pressure and, thus, the wear of the parts.

All these requirements are fulfilled by the device according to the present invention which is characterised in that the radial forces are transmitted from the ball bearing to the separator frame or a part mounted thereon, by an annular element through a spring system, and the axial forces are transmitted to the frame by means of a second spring system, the said annular element making a tight joint with the rotating parts and with the separator frame or the part mounted thereon.

In order that the invention may be more clearly understood one particular embodiment thereof will now be described with reference to the accompanying drawing, which shows a vertical section of a bowl mounting according to the invention. Referring to this drawing 1 indicates the separator bowl and 2 the bowl spindle. The vertical and axial forces are taken up by a ball bearing 3 which is secured to the spindle by means of a threaded sleeve 4. The radial forces emanating from the outer race 5 of the ball bearing are transmitted [illegible] through a spring system 7, to a spring casing 8 which is secured to the frame 9 with screws. The annular element 6 will thus only be able to move in a radial direction and is always concentric with the spindle. It tightens against the spring casing 8 at the surface 28 and against the surface 10 of the rotating parts. Due to the manner in which the element 6 performs its movements, a very small play is sufficient at these contact surfaces. If there is a difference in pressure in the chamber 11, in which the bowl rotates, and chamber 12, which houses the driving mechanism of the bowl, the air currents through the bearing device will be restricted by the small play at 28 and 10. The velocity of the air through the bearing 3 or

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through the relatively wide gap 13 will not be high, and therefore even in the case of an ascending air current there is no risk of the lubricating oil leaking out of the chamber 12. Through the spaces 13 and 14 and the channel 15 oil will pass to the ball bearing and the parts of the spring system, and in this way a perfect lubrication is ensured. The element 6 is provided with a space 16 for collecting the oil, and it may also be provided with holes or channels 17 through which the oil, after having passed through the ball bearing, is conducted to the spring system, from where it can flow back to the chamber 12.

The vertical forces are taken up by a sleeve member 18 which, in radial sense, is guided in the annular element 6 and, consequently, will participate in the radial movements performed by the spindle if the bowl is out of balance or the separator is installed on board a ship. The sleeve element 18 rests on a washer 19 which, radially, is held firm by the spring casing 8, and the washer is, in its turn supported by a second spring system comprising helical springs 20 arranged in said casing 8. The object of these supporting springs 20 is mainly to distribute the vertical forces equally round the outer race of the ball bearing 3. Between the elements 18 and 19 there will thus be a sliding movement at the surface 27. Due to the fact, however, that the surface can be made large and is well lubricated, the wear will be insignificant. The friction at this point has a certain advantage, because it reduces the vibrations caused by the bowl when it is out of balance. If the radial movements of the spindle are very small the washer 19 may be omitted, the springs 20 then lying direct against the element 18 or, in certain cases, possibly direct against the race 5. Instead of the springs 20 other forms of flexible element may, of course, be used. It is important that the space 13 should communicate with the chamber 12 through relatively wide channels to permit the oil, which has reached said space, to flow down into the chamber 12.

The possibility that the chamber 11 may be filled with liquid, through a faulty regulation of the valves or cocks in the supply and discharge piping of the separator must be reckoned with. In order to prevent this liquid from running through the bearing device down into the chamber 12, a cap or shield 21 may be placed round the device and the space 22 between the cap 21 and the bearing device may also be provided with a discharge opening 23, as shown in the drawing. Above the cap 21 it is advisable to place a guard 24 which is fastened to the spindle and covers the top opening of the cap 21. The gap 25 between the cap and the guard should be as small as possible, because the flow of the liquid through it should not become so great that the space 22 is filled with liquid which might then run down into the bearing device. When assembling the parts, the width of the gap 25 can easily be adjusted by placing washers 26 between the sleeve 4 and the guard 24.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. A flexible bearing device for spindles in centrifugal separators adapted to take up both radial and axial forces by means of a ball bearing, characterised in that the radial forces are transmitted from the ball bearing to the separator frame, or a part mounted thereon, by an annular element through a spring system, and the axial forces are transmitted to the frame by means of a second spring system, the said annular element making a tight joint with the rotating parts and with the separator frame or the part mounted thereon.

2. A flexible bearing device according to claim 1, characterised in that the axial forces are transmitted to the second spring system by means of a sleeve member which is radially guided by the annular element.

3. A flexible bearing device according to claim 1 or 2 characterised in that the second spring system consists of a number of helical springs arranged between the frame and a washer radially guided in the frame.

4. A flexible bearing device according to claim 1, 2 or 3, characterised in that the bearing device is surrounded by a fixed cap, a discharge opening is provided inside said cap and the spindle is fitted with a guard for preventing liquid from running down between the cap and the bearing device.

5. A flexible bearing device for the spindle of centrifugal separators constructed and adapted to operate substantially as herein described with reference to the accompanying drawings.

Dated this 20th day of May, 1946.

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